

III. Remarks

A. Amendments to the Claims

Applicants have amended claims 21–22, 26–28 and 39–40 to incorporate into those claims the limitations of claim 22, *i.e.*, the unsaturated monomer has a functional group that is selected from quaternary ammonium. Claims 22 and 26–28 also set forth that the quaternary ammonium is selected from methylamidopropyltrimethylammonium chloride. Support for the amendments is provided by claims 21 and 27 and by the Specification at Paragraph [030].

B. Common Ownership of Claimed Subject Matter

In Paragraph 3 of the Action, the Examiner makes the following statement:

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the Examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Applicants confirm that the subject matter of the pending claims was commonly owned at the time any inventions covered therein were made.

C. Rejection of Claims under 35 U.S.C. Section 103

1. Claims 21, 23–27, 39 and 40 are rejected under 35 U.S.C. Section 103(a) as being unpatentable over U.S. Patent No. 3,461,052 to Restaino et al.

This rejection does not include claim 22. Claims 21–28 and 39–40 now contain the limitations of claim 22.

As claim 22 was not rejected and all of the pending claims now recite the limitations of claim 22, the rejection of claims 21, 23–27 and 39 and 40 is now moot and should be withdrawn.

2. Claims 22 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Restaino et al. as applied to claims 21, 23–27, 39 and 40 above, and further in view of United States Patent No. 6,939,536, to Chen et al.

(a) Examiner's reasons in support of the rejection

The Examiner's reasons in support of the rejection appear on page 5 of the Action, and are set forth below for convenient reference:

Applicants claim a method for grafting an unsaturated monomer onto a guar, wherein the [functional] group of the unsaturated monomer is a quaternary ammonium group.

The above description of the process for producing graft copolymers using radiation in the Restaino et al. patent is incorporated into the current rejection.

The instantly claimed method of grafting an unsaturated monomer onto a guar differs from the method of producing graft copolymers using radiation of the Restaino et al. patent by specifically claiming that the function group of the unsaturated monomer is a quaternary ammonium group.

The Chen et al. patent shows that the [presence] of a quaternary ammonium with guar is well known in the art by disclosing in column 33, lines 51 and 52, a quaternary ammonium derivative of hydroxypropyl guar.

One of ordinary skill in this art would be motivated to combine the teaching of the Restaino et al. patent with the teaching of the Chen et al. patent since both documents disclose guar containing compositions that can be used in cosmetic products.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute for the functional group grafted on the guar of the Restaino et al. patent with a quaternary ammonium derivative in view of the recognition in the art, as evidenced by the Chen et al. patent, that a composition comprising quaternary ammonium derivative of hydropropyl guar is effective in treating keratin.

(b) Legal standard for determining whether Applicants' claims are obvious under 35 U.S.C. Section 103

The legal interpretation of Section 103 to be applied is set forth in the recent Supreme Court decision of *KSR International Co. v. Teleflex Inc. (KSR)*, 550 U.S. ___, 82 USPQ2d 1385 (2007). *KSR* cites *Graham v. John Deere Co. of Kansas City* (383 U.S. 1, 17B18 [148 USPQ 459] (1966)) as setting out an objective analysis for applying Section 103. (82 USPQ2d at 1388). The objective analysis is as follows:

Under § 103, the scope and content of the prior art are to be determined, the differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy.

(148 USPQ at 467).

Accordingly, the factual inquiries set forth by the Court are as follows:

- [T]he scope and content of the prior art are . . . determined;
- Differences between the prior art and the claims at issue are . . . ascertained;
- The level of ordinary skill in the pertinent art [is] resolved; and
- Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized. . . .

(c) Application of the Graham v. John Deere Co. factual standards

(i) Determining the scope and content of the prior art

Restaino et al. discloses:

A process for the radiation induced grafting of vinyl monomers to hydrophilic polymeric substrates, particularly polyvinyl alcohol. . . . The substrate moistened with water is contacted with a fluid vinyl monomer capable of free radical catalyzed polymerization and irradiated with high energy ionizing radiation to a dosage of 2000 to 10^8 roentgens. (*emphasis added*)

(Abstract).

With respect to the process, Restaino et al. discloses that:

The process of the present invention comprises contacting the vinyl monomer in fluid, preferably liquid, form with moist substrate [*i.e.*, guar] irradiated with ionizing radiation. The irradiation of the moist substrate may be effected prior to its contact with the fluid monomer or while it is in contact therewith. In the foregoing, and throughout this specification and in the appended claims the terms "moist" and "moisture" refer to the presence of water as the moistening liquid. The degree of moistening may vary over a wide range. As little as 10% by weight of water on the hydrophilic substrate markedly increases the rate of grafting.

(Restaino et al., column 2, lines 23–34).

The Examiner's characterization of the disclosure of Restaino et al. is that:

. . . [Applicants' claimed] drying step is inherently recited in the Restaino et al. patent since the Restaino et al. patent discloses subjecting radiation to substrates that have a moisture content that [is] obtained using the drying step of the instant claims. See column 2, lines 32–34 of the Restaino et al. patent wherein it is disclosed that as little as 10% by weight of water on the substrate thereof markedly increases the rate of grafting, which appears to embrace the amount of water that may be present in the guar after the recited drying step in Claim 21. The disclosure of 10% by weight of water in the substrate thereof appears to embrace the drying step recited in instant Claim 21.

(Examiner's Action, page 4, lines 9–16).

The Examiner also observes that:

The instantly claimed method of grafting an unsaturated monomer onto a guar differs from the method of producing graft copolymers using radiation of the Restaino et al. patent by specifically claiming that the function group of the unsaturated monomer is a quaternary ammonium group.

(Examiner's Action, page 5, lines 9–12).

As the Examiner notes, the term “moist” includes as little as 10% by weight of water as the hydrophilic substrate. Restaino et al., however, is relied on by the Examiner as disclosing graft polymerization by irradiation of the hydrophilic substrate with a vinyl monomer. As noted above, in the Abstract and in the disclosure of the Restaino et al. process quoted above, the vinyl monomer used in the graft polymerization is *in fluid, preferably liquid* form. The Restaino et al. process noted above discloses irradiation of the moist substrate prior to its contact with the fluid monomer or while it is in contact therein. The option most pertinent is irradiation of the moist hydrophilic substrate while it is in contact with the fluid monomer.

Examples I–VI, IX–XXI and XXVII according to the invention disclose a moist hydrophilic substrate, *e.g.*, guar, being contacted with a vinyl monomer present in the form of a solution. The remaining Examples disclose the irradiation of the hydrophilic substrate prior to contact with the solution of vinyl monomer, or disclose further polymerization onto the grafted polymer of hydrophilic substrate and vinyl monomer.

In all of the Examples, the polymerization of the hydrophilic substrate, if moist, with the solution of vinyl monomer, results in a product that weighed more than the treated material, demonstrating that the product was a graft copolymer having a higher molecular weight than the starting polysaccharide. The comparative Examples in which the material to be irradiated is dry prior to irradiation resulted in no or virtually no weight gain. See column 4, lines 22–25, column 5, lines 44–48, and column 6, lines 20–22 and 71–72. The absence of a weight gain indicates that the irradiation step produces no cross-linking, *i.e.*, the product is not a graft copolymer.

In support of the rejection, the Examiner also relies on Restaino et al. as disclosing “a process for the production of graft substrates by ionizing radiation, wherein a hydrophilic polymeric substrate is irradiated in the presence of a solution of a monomeric vinyl compound.” The Restaino et al. patent is also relied on as teaching using radiation to produce graft copolymers wherein the radiation may also be used to depolymerize the polymers.” (Examiner’s Action, page 3, lines 18–20 and lines 27–30). The Examiner particularly relies on the passage at column 3, lines 11–13, which is part of the following passage at column 3, lines 4–13:

Higher radiation doses, up to and even exceeding 10^8 roentgens may be employed. Obviously, if the substrate undergoes depolymerization or degradation under the effect of radiation and it is desired to retain the polymeric structure of the substrate the dose must be correspondingly limited. Thus, when grafting onto cellulose, excessive degradation is avoided by keeping the radiation dose below about 10^6 roentgens. Useful graft copolymers of **cellulose** degradation products may, however, be obtained by employing higher radiation doses. (*emphasis added*)

Applicants’ claimed method is directed to the depolymerization of guar, not cellulose.

United States Patent No. 6,939,536 B2 to Chen et al. is directed to:

A composition for treating a keratin based substrate that includes a cosmetically acceptable medium containing a water-soluble interjacent complex. The water-soluble interjacent complex includes a water-soluble polymer and a second water-soluble polymer formed by polymerizing one or more water-soluble monomers in the presence of the first water-soluble polymer. The water-soluble interjacent complex is characterized in that it forms a solution in water that is free of insoluble polymer particles. The water-soluble interjacent complex is used in a method of treating a keratin based substrate, whereby a cosmetically acceptable medium is applied to the substrate and contains from 0.1–20% by weight of the water-soluble interjacent complex.

(Abstract).

Therefore, the water-soluble interjacent complex includes a first water-soluble [host] polymer and a second water-soluble polymer formed by polymerizing one or more water-soluble monomers in the presence of the first water-soluble polymer.

The Examiner relies on Chen et al. for the disclosure of a quaternary ammonium derivative of hydroxypropyl guar (Examiner's Action, page 5, lines 13–15). However, the quaternary ammonium derivative of hydroxypropyl guar is identified as one of a very large number of host polymers. As noted above, Chen et al. discloses the formation of an interjacent complex that comprises a water-soluble host polymer such as a quaternary ammonium derivative of hydroxypropyl guar and a second water-soluble polymer formed by polymerizing one or more water-soluble monomers in the presence of the first water-soluble polymer. Accordingly, the interjacent complex disclosed in Chen et al. does not, and cannot consist of a quaternary ammonium derivative of hydroxypropyl guar but must also include one or more water-soluble monomers.

Chen et al. further discloses that the interjacent complex composition is not formed by a method of grafting. Chen et al. discloses that the interjacent complex is essentially free of grafting in the following passage:

As used herein, the terms "interjacent complex" and "polymer-polymer complex" refer to two polymers that are different from each other, and in intimate contact with each other. The interjacent or polymer-polymer complex is prepared by polymerizing monomers to form a polymer in the presence of a host polymer as described below. The interjacent complex is substantially free of grafting, which occurs only to the extent that chain transfer reactions to the host polymer occur.

(Chen et al., column 6, lines 52–60).

Chen et al. discloses that the interjacent complexes may be prepared by conventional solution polymerization techniques, or alternatively, by water-in-oil emulsion polymerization techniques (Column 14, lines 11–12). Chen et al. does not disclose or even suggest polymerization by irradiation. Nevertheless, the polymer-polymer complex is bound together. Chen et al. discloses that:

These polymer-polymer interactions and entanglements aid in stabilizing the interjacent complex that forms and minimizes the potential negative consequences that may occur due to, for example, poly salt formation. Laboratory experiments indicate that the two polymer components in the present interjacent complex cannot be separated by conventional separation techniques, indicating the unique structure that is formed between the two polymers.

(Chen et al., column 16, lines 3–10).

**(ii) Ascertaining the differences
between the prior art and the claims at issue**

Applicants' method for grafting an unsaturated monomer as claimed in claim 21 comprises the following steps: (1) forming a mixture comprised of an unsaturated monomer having a functional group selected from quaternary ammonium and a water-soluble or water-dispersible guar; (2) drying the mixture; and (3) irradiating the mixture with an amount of electron beam radiation sufficient to form an unsaturated monomer-water-soluble or water-dispersible guar graft copolymer, wherein the graft copolymer is depolymerized to a molecular weight lower than the molecular weight of the ungrafted guar, and the guar in the copolymer has

a molecular weight of between 100,000 and 700,000 Daltons. The remaining claims 22–28, 39 and 40 are either dependent upon claim 21 or incorporate the limitations of claim 21.

The Examiner notes that:

[T]he instantly claimed method of grafting an unsaturated monomer onto a guar differs from the method of producing graft copolymers using radiation of the Restaino et al. patent by specifically claiming that the [functional] group of the unsaturated monomer is a quaternary ammonium group.

(Examiner's Action, page 5, lines 9–12).

Accordingly, Restaino et al. does not disclose Applicants' method step (1) of forming a mixture comprised of an unsaturated monomer having a functional group selected from quaternary ammonium.

As discussed above Section III, C, 2, (c), (i), beginning on page 8, Restaino et al. also does not disclose Applicants' claimed drying step. Instead, as set forth above, in the Restaino et al. process the hydrophilic polymeric substrate is moistened with water and contacted with a fluid vinyl monomer (Abstract). Therefore, the Restaino et al. method includes a step in which the hydrophilic substrate is moistened to 10% or more by weight of water. The hydrophilic substrate must be further moistened by the contact with the fluid vinyl monomer prior to the graft polymerization of the hydrophilic polymer substrate and monomer. Indeed, in all of the Examples according to the invention the monomer is employed in the form of a solution.

In summary, Restaino et al. employs two moistening steps. They are 1) moistening the hydrophilic substrate to 10% or more by weight of water and 2) further moistening the moist hydrophilic substrate with fluid vinyl monomers. The two moistening steps disclosed in Restaino et al. lead one of ordinary skill in the art away from the drying step (2) of Applicants' claimed method.

Restaino et al. also does not disclose depolymerization step (3) of Applicants' claimed method. The only reference in Restaino et al. to depolymerization is with cellulose, not guar. Restaino et al. does not even disclose depolymerization of cellulose to Applicants' claimed molecular weight range.

The Examiner relies upon Chen et al. as disclosing that “a composition comprising [a] quaternary ammonium derivative of hydroxypropyl guar is effective in treating keratin.” (Examiner’s Action, page 5, lines 21–23).

In fact, Chen et al. discloses an interjacent complex including a first water-soluble host polymer, such as a quaternary ammonium derivative of a hydroxypropyl guar, that is polymerized with one or more water-soluble monomers in the presence of the host polymer. (See column 33, lines 19–62, in particular lines 51–56). Furthermore, as noted above, the polymerization is not a graft polymerization, *i.e.*, a product obtained through Applicants’ claimed method for grafting an unsaturated monomer onto a guar. Indeed, Chen et al. discloses several problems with graft polymers and differences between the polymers formed by the method disclosed in Chen et al. and graft polymers obtained by Applicants’ claimed method (Column 2, line 60, to column 3, line 13). Hence, Applicants’ claimed method produces a different composition than the composition obtained by the method disclosed in Chen et al.

As Chen et al., like Restaino et al., does not disclose a depolymerized guar polymer produced according to Applicants’ claimed method, Applicants’ claimed method differs from Restaino et al. and Chen et al. as being directed to a different method of polymerization and production of a different polymer.

Chen et al., like Restaino et al., also does not disclose Applicants’ claimed drying step. Chen et al. also does not disclose Applicants’ claimed method step of polymerization through radiation or Applicants’ claimed depolymerization of the polymer to a different molecular weight range.

Accordingly, one of ordinary skill in the art cannot combine the disclosure of Restaino et al. and Chen et al. to obtain Applicants’ claimed method.

(iii) Resolving level of ordinary skill in the pertinent art

The inventors of the present application and the inventors of the prior art patent would represent persons of ordinary skill in the art.

**(iv) Utilizing, if possible, such secondary considerations
as commercial success, long felt but unsolved needs
and failure of others**

There has been a need for a method of modifying water-dispersible and/or water-soluble guar with unsaturated monomers having a functional group selected from quaternary ammonium and by electron beam radiation to produce a polymer in which the grafted guar has a controlled molecular weight that is lower than the original guar.

**(d) Applicants' claimed method is nonobvious over the
Restaino et al. patent and further in view of Chen et al.**

Accordingly, for the reasons set forth above, the rejection of claims 22 and 28 under 35 U.S.C. Section 103(a) as being unpatentable over United States Patent No. 3,461,052 to Restaino et al., in view of United States Patent No. 6,939,536 to Chen et al., is untenable and should be withdrawn.

IV. Conclusion

Applicants believe that the foregoing Amendments and Remarks constitute a complete response under 37 C.F.R. Section 1.111 and that all bases of rejection in the Examiner's Action have been adequately rebutted or overcome. A Notice of Allowance in the next Office is, therefore, respectfully requested. The Examiner is requested to telephone the undersigned attorney if any matter that can be expected to be resolved in a telephone interview is believed to impede the allowance of pending claims 21–28 and 39–40 of United States Patent Application No. 10/607,079.

Respectfully submitted,

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